

REMARKS

By the present amendment, claims 1, 3 and 4 have been amended to, among other things, further clarify the concepts of the present invention and/or additionally distinguish over the cited patent. Entry of these amendments is respectfully requested.

In the Office Action, claims 1, 2, 4 and 5 were rejected under 35 USC § 102(b) as being anticipated by the patent to Claussen. In addition, claim 3 was rejected under 35 USC § 103(a) as being unpatentable over the same patent to Claussen. In making the former rejection, it was asserted that the cited patent teaches each and every feature of the bent work, bending method and bending device as set forth in the noted claims. As to the latter rejection, it was acknowledged that the method of the Claussen patent does not bend a material having the L- or U-shaped configuration as claimed. It was then asserted that it would be obvious to use such a material. Reconsideration of these rejections in view of the above claim amendments and the following comments is respectfully requested.

It is submitted that the Claussen patent does not teach or suggest the subject matter as now defined by claims 1-5. More particularly, the Claussen patent relates to an apparatus for use in the production of spirally welded or helically welded tubes or pipes wherein sheet material in the form a band is formed into the desired diameter. Specifically, the patent teaches an apparatus for forming spirally welded tubes or pipes by welding the "sides" of spirally bent sheet metal, that is, welding the sides along the length of the metal sheet.

According to the Claussen patent, the incoming metal sheet metal band first is bent spirally by rollers 1, 2 and 3, and then the spirally bent long sides of the band are "tack-welded" just ahead or on the other side of the roller 3, that is, the long side of the spirally bent metal band and the long side of the already finished pipe are joined and "tack-welded". Such operation is repeated so as to form a tube or pipe shape by using the spirally bent metal band. Then, the "tack-welded" portion is substantially welded so as to produce a completed spirally welded tube or pipe. Thus, in the tube or pipe produced by the apparatus according to the Claussen patent, the two elongated sides of the spirally bent metal sheet are joined and welded to produce the spirally welded tube or pipe.

In distinct contrast, the presently claimed invention relates to, in one aspect, bent work manufactured by a method comprising preparing a belt-shaped thick steel material having an L-shaped cross-section and having two elongated sides and two ends, and forming a cylinder by bending the belt shaped thick steel material so that the ends of the belt-shaped thick steel material abut each other. Thus, the bent work manufactured by the present invention is completely different from the spirally welded tube or pipe produced by the apparatus of the Claussen patent.

Specifically, since the metal sheet is spirally bent by the apparatus of the Claussen patent, the long side of the spirally bent metal band and the long side of the already finished pipe are joined, for example, by "tack-welding", that is, the distance is the same as the length of the metal sheet. Since the distance to be joined becomes longer, it is difficult to maintain the two long sides as a joining state during bending. Therefore, the two long sides are "tack-welded" during bending so as to

maintain the joined state, which requires an apparatus for the "tack welding." As a result, production cost becomes more expensive. Further, since, in the tube or pipe produced by the apparatus of the Claussen patent, spirally welding parts are formed over the circumference during one bending process, the tube or pipe produced thereby is poor in its strength and is remarkably inferior in its appearance.

In addition, it is submitted that the present claims are distinguished over the Claussen patent for failing to teach the use of belt-shaped steel material having an L-shaped or U-shaped cross-section as a starting material. In the Action, it was asserted, at least with respect to claim 3, that use of such a starting material would be obvious to one of ordinary skill in the art. In response, it is submitted relative to the patentability of the claimed subject matter that obviousness under Section 103 of the statute requires a suggestion in the art to modify the teachings of the cited patent as proposed with the expectation that the results achieved would have been predicted by that person of ordinary skill. It is submitted that the Claussen patent contains no such suggestion.

The presently claimed invention, as noted above, relates to bent work manufactured by a method comprising preparing a belt-shaped thick steel material having an L-shaped cross-section and having two elongated sides and two ends, and forming a cylinder by bending the belt shaped thick steel material so that the ends of the belt-shaped thick steel material abut each other. Therefore, the cylinder having an L-shaped section as the bent work according to the present can be manufactured by one bending process. Further, the obtained bent work is strong and has a superior appearance.

Since the bent work according to the present invention can be manufactured by one bending device, resulting in a low cost. Still further, the bent work having the above effects can be manufactured according to the bending method and bending device according to the present invention. The Claussen patent fails to teach or suggest the use of an L-shaped or U-shaped steel material as a starting material such as recited in independent claim 1 directed to bent work, independent claim 3 directed to a bending method and independent claim 4 directed to a bending device.

In distinct contrast, it is submitted that the use of an L-shaped steel material, or U-shaped material, to form spiral pipe or tube in accordance with the teachings of the Claussen patent would be inappropriate for forming pipe or tube since the finished tube would have projecting spirals on either the inside or outside. Such a structure would not produce a smooth and desirable product, both in terms of appearance and function.

In summary, it is submitted that the subject claims distinguish over the cited Claussen patent in that, in accordance with the subject invention, the ends of the formed work are butted together. In distinct contrast, the bent work in accordance with the cited patent is spirally welded to form the final product. Thus, a major distinction, among others, is that the "sides" of the work are butted together in accordance with the Claussen patent whereas in the invention the "ends" of the belt-shaped steel material as having two elongated sides and two ends are abutted. Furthermore, the subject invention utilizes belt-shaped steel material having an L-shaped or U-shaped cross section, a feature not taught by the Claussen patent.

For the reasons stated above, withdrawal of the rejections under 35 U.S.C. § 102(b) and § 103(a) and allowance of claims 1 through 5 as amended over the cited Claussen et al patent are respectfully requested.

In view of the foregoing, it is submitted that the subject application is now in condition for allowance and early notice to that effect is earnestly solicited.

In the event this paper is not timely filed, the undersigned hereby petitions for an appropriate extension of time. The fee for this extension may be charged to Deposit Account No. 01-2340, along with any other additional fees which may be required with respect to this paper.

Respectfully submitted,

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Marked Up Version of Amendments to Specification and Claims

IN THE CLAIMS:

1. (Amended) A bent work manufactured by a method comprising the steps of:
preparing a belt-shaped thick steel material having an L-shaped cross-section and having two elongated sides and two ends; and
forming a cylinder by bending the belt shaped thick steel material ~~having an L-shaped cross-section; and~~
~~welding so that the ends of the belt-shaped thick steel material formed into the cylinder to abut each other.~~

3. (Amended) A bending method comprising the steps of:
providing a belt-shaped thick steel material having one of an L-shaped cross-section and a U-shaped cross-section and having two elongated sides and two ends; and
forming the material into a cylinder so that the ends of the belt-shaped thick steel material abut each other by using a center roller to be driven to rotate which is positioned and fixed in a predetermined position and a pair of bending rollers to be driven to rotate which is disposed opposing the center roller at one side of the center roller, movable toward and away from the center roller, the belt-shaped thick steel material having one of an L-shaped cross-section and a U-shaped cross-section being bent by being transferred between the center roller and the pair of bending rollers.

4. (Amended) A bending device for ~~forming a cylinder by bending a belt-shaped thick steel material~~ having two elongated sides and two ends to form a cylinder where the ends of the belt-shaped thick steel material abut each other, the bending device comprising:

a center roller to be driven to rotate positioned and fixed in a predetermined position; and

a pair of bending rollers to be driven to rotate disposed opposing the center roller at one side of the center roller, movable toward and away from the center roller, the belt-shaped thick steel material being bent by being transferred between the center roller and the pair of bending rollers,

wherein the center roller is provided with an annular recess formed therein around the center roller, the pair of bending rollers are respectfully provided with annular convex portions formed thereon around the bending rollers, the convex portions to be inserted in the annular recess of the center roller at a predetermined position of the annular recess of the center roller, and the belt-shaped thick steel material having one of an L-shaped cross-section and a U-shaped cross-section is transferred between the center roller and the pair of bending rollers in a manner such that a concave portion of the belt-shaped thick steel member having one of an L-shaped cross-section and a U-shaped cross-section faces toward the outside at the annular recess of the center roller and the convex portions of the pair of bending rollers are positioned in the concave portion of the belt-shaped thick steel material having one of an L-shaped cross-section and a U-shaped cross-section.